The Influence of Tactical Formation on Physical and Technical Match Performance in Male Soccer: A Systematic Review

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Abstract

The number of investigations that specifically address the influence of formation on soccer performance has increased in recent years. Since there is no overview that summarizes these effects, this systematic review aims to synthesize the available literature on the effects of tactical formation on physical and technical match performance.

According to the PRISMA 2020 guidelines, a systematic search was performed (Data Bases: PubMed, Web of Science). Studies were included, if they reported any physical (e.g. sprinting distance) or technical (e.g. number of passes) match performance parameter and compared at least two different formations. The study outcomes were synthesized descriptively.

The effect of formation on physical performance was investigated in ten studies while three studies investigated the effect on technical performance (11 studies included). The studies revealed that formation has an effect on physical and technical match performance of soccer players both on a team and a positional level. On a team level, smaller differences were observed for formations that are similar in the number of players in each playing position (i.e. 4-5-1, 4-2-3-1). Furthermore, physical match performance was higher in formations with three defenders (e.g. 3-5-2) in comparison to formations with four defenders (e.g. 4-4-2). On a positional level, all positions were affected in a similar way by formation.

Therefore, formation affects the physical and technical match performance of soccer players and if the playing position is also considered, the results become even more meaningful. The studies were very heterogenous regarding their methodology (i.e. parameters, sample size). The findings can help coaches to design their training programs and to prepare the players for a specific positional role depending on the tactical formation.

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Keywords: team sports, football, tactics, running performance, technical performance

HIGHLIGHTS

Tactical formation affects physical and technical match performance in soccer.

On a team level, physical match performance is higher in formations with three defenders (e.g. 3-5-2) in comparison to formations with four defenders (e.g. 4-4-2).

When comparing formations (i.e. 4-5-1, 4-2-3-1) on a team level, that are similar in the number of players in each playing position (defender, midfielders, forwards), the differences were smaller.

On a positional level, all positional groups are affected in a similar way. However, the sprinting distance of full backs and central midfielders remained rather stable between tactical formations, while more pronounced differences were found for all remaining positions.

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1 INTRODUCTION

In general, the performance of a soccer team is influenced by a variety of factors like the market value, playing at home or away, or the opponent quality [1–3]. Since more and more investigations especially analyzed the physical (e.g. distance covered at different speed zones, number of sprints, number of decelerations) and technical (e.g. number of passes, number of dribbling's, number of shots) match performance of individual players, the influence of different contextual factors on individual soccer match performance was examined in different studies [3–5]. For example, the origin of the league, the competitive level, and the quality of the opposition team impact the physical and technical match performance of soccer players [6–8]. Besides these contextual factors, tactical variables which could potentially influence match performance have recently received increasing attention.

Tactical factors (e.g. playing position, tactical formation) determine the way players behave on the pitch. In different situations (e.g. defending or attacking) players act differently according to their positional role in the tactical formation. To be more specific, players in distinct playing positions need to behave tactically different to help their team in various game-play situations. Previous studies have examined physical and technical match performance and were able to show that the players' performance is highly dependent on tactical factors [9,10]. It is commonly accepted that the tactical factor playing position impacts the match performance of soccer players [11]. Looking at the physical performance, wide positions (wide midfielder, full back) display the highest high-intensity and sprinting distances [5,12,13]. Further, central midfielders show the highest total running distance of all positional groups [14–16]. Regarding technical performance, forwards tend to most often lose duels and have most turnovers, while midfielders (wide, central) indicate more ball-possessions than other positions [17].

In the following, another tactical factor should be considered: the tactical formation. Tactical formation is fundamentally defined by the number of players playing in each positional group. For example, a 4-4-2 formation consists of four defenders, four midfielders, and two forwards. The tactical formation characterizes the distribution of the players on the pitch and therefore, influences the defensive and offensive interaction of the players during the match [18,19]. Indeed, the match performance of different playing positions can change according to the tactical formation. Subsequently, the influence of tactical formations on physical and technical match performance was examined by an increasing amount of investigations. For example, Bradley et al. [20] distinguished between three positional groups (defenders, midfielders, and attackers) and found that defenders showed lower total distance and high-intensity distance when playing in a 4-4-2 formation, compared to defenders in a 4-3-3 or 4-5-1 formation.

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Another investigation revealed that midfielders (central, wide, or offensive) play more passes in a 4-4-2 formation, than midfielders in a 4-2-3-1 formation [21].

Previous reviews have already looked at the match performance of soccer players from a variety of perspectives[11,22–25]. However, the current body of literature is characterized by heterogeneous methodological approaches, and an overview that summarizes the way tactical formation affects soccer match performance on a team and a positional level does not exist. Most of the mentioned reviews focused on collective behavior and do not consider the individual match performance of players. Therefore, this systematic review aims to synthesize the available literature on the effects of tactical formation on physical and technical match performance of male soccer players both on a team and a positional level. The results of this review could help scientists and practitioners to describe and understand the influence of tactical formation on physical and technical match performance. Further, they could facilitate selecting the players for a specific positional role in a particular tactical formation and adapting training and recovery processes to prepare the players for the demands of a specific position in a preferred tactical formation.

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2 METHODS

This systematic review was written according to the guidelines of the PRISMA 2020 statement [26]. The review was not registered prior to submission.

2.1 Databases and search strategy

The literature search was undertaken using the electronic databases PubMed and Web of Science. The search was executed on June 16, 2021. The following search phrases were used:

(1) Soccer OR Football

(2) Formation OR System OR Tactical OR Tactics

(3) Position OR Performance OR Physical OR Technical OR Load OR Running OR Acceleration OR Deceleration OR Total Distance OR High-intensity OR Sprinting OR Passing OR Shooting OR Crossing OR Dribbling OR Duel

First, each of the search items (1-3) was conducted independently according to Hands and Jonge [27]. Afterward, one Boolean search using the AND operator was performed. Accordingly, the results of both databases were combined to produce the total search outcome. One reviewer (LeoF) conducted the selection of articles by screening the titles, the abstracts, and subsequent the full-texts. If any discrepancies occurred, they were resolved through discussion until consensus was reached (LeoF, LeaF, SA, HW, DJ). There was no restriction on the publication date. Only articles written in English and published in peer-reviewed journals were considered. Further selection criteria are mentioned in the next paragraph. Later, a manual search was conducted by screening the reference list and by checking the citation list of each included paper.

2.2 Study selection criteria

To set clear inclusion and exclusion criteria, the PICOS method was used (see Supplement 1 Table 1). Only investigations dealing with healthy male professional soccer players (adult & youth players) were included. The articles were only included when reporting any physical (e.g. distance covered at different speed zones, number of sprints, number of decelerations) or technical (e.g. number of passes, number of dribblings, number of shots) match performance parameter. Further, they had to compare at least two different tactical formations. Subsequently, articles that compared performance measures between playing positions but did not consider at least two tactical formations were excluded. Further, studies reporting results for only one tactical formation, including friendly matches or focusing on the effect of the opposition team tactical formation were excluded too. Review articles or conference abstracts were not considered in this systematic review.

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2.3 Methodological quality assessment

All included articles were evaluated by one reviewer (LeoF) on methodological quality according to predetermined criteria (see Supplement 3, Tables 1-2). The criteria were adapted from Castellano et al. [28] because they already examined methodological quality in a similar research field. To determine the overall quality, each fulfilled criterium was rewarded with one point, resulting in a maximum score of seven. The final scores were rated as low methodological quality for final scores below 50% (score 1-3.5), medium methodological quality for scores between 50-75% (score 4-5), and good methodological quality for final scores over 75% (6-7).

2.4 Data extraction and summary measures

The data were extracted by one reviewer (LeoF), generally referring to study characteristics and outcome measures.

Study characteristics included variables like country, competition, playing season, the number of games, the number of players, and the number of teams that were included. Further, the tracking system of each study was reported. Tracking systems were either a global positioning system (GPS), a local positioning system (LPS), or a multicamera tracking system including the respective company. In addition, it was recorded how the tactical formations were collected and how in-game changes in tactical formation were handled. These study characteristics were included because previous studies have shown that those contextual factors can have an impact on the outcomes [6,8,29].

In the present review, all technical and physical match performance parameters that were investigated in the respective study were included. The results of the studies were divided by applying two differentiations. First, technical and physical outcomes were separated. Second, outcomes regarding the tactical formation only and outcomes that considered tactical formation in addition to playing position were separated as well. Hence, there are four separate outcome sections. To assess the effect of tactical formation on match performance, the percentage difference between the outcome measures of the different tactical formations was documented. Further, Cohen's d effect sizes [ES] were calculated for each physical or technical match performance parameter, respectively. To interpret the magnitude of differences, the ES were categorized into trivial ($ES < 0.2$), small ($0.2 \leq ES < 0.5$), medium ($0.5 \leq ES < 0.8$) and large ($ES \geq 0.8$) effects [30]. If a study did not report ES themselves, the ES was calculated using the information provided in the respective articles. If the sample sizes for the respective groups were not mentioned in the specific article, the data were requested from the corresponding authors. In case the authors did not respond, ES could not be estimated.

Due to the expected small number of included studies we decided to synthesize the results descriptively.

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If numeric data was missing or the results were obviously erroneous, the corresponding authors were contacted as well. When the respective authors did not respond, the particular sections were tagged subsequently (i.e. “not specified”).

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3 RESULTS

3.1 Search results and study selection

A flow diagram for the selection of the studies can be found in Figure 1. The results of the database searches are presented in Supplement 1 Table 2. In total, 16,228 articles were identified. The manual search through reference lists and citing lists of included studies resulted in one additional article being identified. Screening of title and abstract resulted in 81 articles assessed for eligibility. Moving on, 70 articles were excluded due to the reasons presented in Figure 1. Exclusion reasons were: only one formation included (two articles) [5,31], analyzing opposition tactical formation (two articles) [12,32], or no formations included (66 articles).

******* (Insert Figure 1 about here) *********

3.2 Methodological quality assessment

All included articles (11) were assessed for methodological quality. For all studies, the average quality score was 5.0 (range 3-7) out of possible 7 points, leading to a medium overall rating of methodological quality.

All eleven included studies precisely stated the study purposes and clearly presented their results with statistical analysis. Most of the studies [14,21,33–38] only mentioned the number of players or games but did not address the number of single-player match observations for every respective group. Further, six studies did only compare two different tactical formations.

3.3 Study characteristics

Based on the suggestions of Rico-González et al. [39], the characteristics of each study are described in Table 1. For each article, information about publication year, country, competition, season, the included games, the included players, the included teams, the tracking system, the respective company, the recording of tactical formation and the way each study dealt with in-game formation changes is provided. The studies were published from 2011 until 2021 and the recorded seasons ranged from 2006/07 until 2018/19. While two studies were conducted in England, Brazil, and Italy respectively, the remaining five studies were conducted in different countries (e.g. Norway, Russia, Croatia, Spain & Argentina). Five studies dealt with the first league and two studies with the second league of the respective country. The other four studies examined other competitions (e.g. U18/U21's, Sao Paulo State Season, World Cup Russia, U19's). The size of the data sets ranged from 16 to 61 games, 19 to 153 players, and 1 to 19 teams. From the included studies (eleven), three investigations compared five

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or more tactical formations. Moreover, two studies only compared two different tactical formations.

Most of the studies used global positioning (GPS) (six) and multi-camera tracking systems (three) to track the match performance while one study used both tracking systems. Only one study used a local positioning system (LPS).

All eleven included studies reported physical performance parameters. Moreover, three studies further investigated technical match performance. The most common physical parameters were total distance, jogging distance, medium-intensity distance, high-intensity distance, sprinting distance, number of sprints, number of high-intensity activities, acceleration, and decelerations. The most common technical parameters were the number of passes and dribblings.

While four studies collected formations through observation by two qualified coaches or researchers and one study collected formations through observation by one qualified coach, six studies did not provide information on the methodology used to collect tactical formation. Four studies excluded games with in-game formation changes and one study found no in-game formation changes. In the remaining six studies, the procedure with in-game formation changes was not explained.

******* (Insert Table 1 about here) *********

3.4 Match performance outcomes and main findings

As mentioned above, the results of all eleven included studies were separated into four sections. First, the effect of tactical formation on physical performance and technical performance will be addressed separately. Second, the effect of the tactical formation in different playing positions will be outlined. Similarly, the physical and technical performance will be addressed individually. To get a robust summary of results, only performance parameters that were recorded in at least two (technical parameters) or three (physical parameters) studies will be analyzed in the following section.

3.4.1 Influence of the tactical formation on physical match performance

10 studies analyzed the effect of the tactical formation on physical match performance (see Table 2).

Total distance

The effect of tactical formation on total distance was examined 10 times. The ES range was trivial to small (percentage difference range [PD]=0.02-10.30%; effect size range [ES]=0.01-0.44; ES not applicable for 2 studies). The studies showed that the tactical formations with the highest total distance

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were either 3-5-2 [33,37,40] or 4-3-3 [14,20,41]. No clear trend regarding the tactical formation with the lowest total distance was observed.

Jogging distance

The effect of the tactical formation on jogging distance (7-14 km/h / 7-15 km/h) was examined 2 times. The ES range was trivial to small (PD=0.22-10.51%; ES=0.01-0.28). No clear trend regarding the tactical formation with the highest and lowest jogging distance was observed.

Medium-intensity distance

The effect of the tactical formation on medium-intensity distance (≥ 14.4 km/h / 15.1-20 km/h / >14.4 km/h) was examined 3 times. The ES range was trivial to small (PD=0.19-8.36%; ES=0.02-0.18; ES not applicable for 1 study). The respective studies found the largest medium-intensity distance in 4-2-3-1 [21,33] and the lowest in 4-4-2 [21,33].

High-intensity distance

The effect of the tactical formation on high-intensity running distance (≥19.8 km/h / 20.1-25 km/h / >19.8 km/h) was examined 5 times. The ES range was trivial to medium (PD=0.13-22.59%; ES=0.00-0.73; ES not applicable for 1 study). The highest high-intensity running distance was found in 4-4-2 [21,32] and 3-5-2 [34,37]. However, Aquino et al. [33] and Tierney et al. [37] found the lowest high-intensity running distance for 4-4-2.

Sprinting distance

The effect of the tactical formation on sprinting distance (≥25.2 km/h / >25 km/h) was examined 3 times. The ES range was trivial to small (PD=0.00-25.39%; ES=0.00-0.33). No clear trend regarding the tactical formation with the highest and lowest sprinting distance was observed.

Number of sprints

The effect of the tactical formation on the number of sprints (≥25.2 km/h / >25 km/h) was examined 3 times. The ES range was trivial to large (PD=0.21-14.00%; ES=0.01-1.27; ES not applicable for 1 study). Studies showed that the tactical formations 4-3-3 [33,34] showed the highest, and the formation 4-4-2 [33,34] the lowest amount of sprints.

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Number of high-intensity actions

The effect of the tactical formation on the number of high-intensity actions was examined 4 times. The ES range was trivial to medium (PD=1.67-29.51%; ES=0.05-0.64; ES not applicable for 1 study). Studies showed the highest number of high-intensity actions for the 4-3-3 [14,41] and the lowest for the 4-4-2 [14,41] formation.

Number of accelerations

The effect of the tactical formation on the number of accelerations was examined 4 times. The ES range was trivial to large (PD=2.94-26.32%; ES= 0.11-1.43; ES not applicable for 1 study). Studies revealed the highest number of accelerations for the 4-2-3-1 [21,37] formation. No clear trend regarding the tactical formation with the lowest number of accelerations was observed.

******* (Insert Table 2 about here) *********

3.4.2 Influence of the tactical formation on technical match performance

3 studies analyzed the effect of tactical formation on technical match performance (see Table 3).

Number of passes

The effect of the tactical formation on the number of passes was examined 2 times. The ES range was trivial to large (PD=0.00-51.42%; ES=0.00-0.96; ES not applicable for 1 study). Studies revealed that the highest number of passes were played in the 4-4-2 formation [20,21]. No clear trend regarding the tactical formation with the lowest number of passes was observed.

Number of dribblings

The effect of the tactical formation on the number of dribblings was examined 2 times. The ES range was trivial to large (PD==14.29-40.00%; ES=0.09-0.21; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest number of dribblings was observed.

******* (Insert Table 3 about here) *********

3.4.3 Influence of the tactical formation in different playing positions on physical match performance

9 studies analyzed the effect of tactical formation in different playing positions on physical match performance (see Table 4).

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Total distance

The effect of the tactical formation in different playing positions on total distance was examined 7 times. For center backs (5 studies), the ES range was trivial to large (PD=0.11-8.64%; ES=0.08-1.31; ES not applicable for 2 studies). Center backs showed the highest total distance in 3-5-2 [34,35,37] and the smallest in 4-4-2 [21,35] or 4-3-3 [34,37] formations. For full backs (4 studies), the ES range was large (PD=1.39-9.14%; ES=0.96-5.58; ES not applicable for 2 studies). Full backs showed the highest total distance in either 3-5-2 [35,37,40] or 4-4-2 [21,34] formations. No clear trend regarding the tactical formation with the lowest total distance for full backs was observed. For central midfielders (4 studies), the ES range was trivial to large (PD=0.12-7.25%; ES=0.02-0.83; ES not applicable for 2 studies). Central midfielders showed the smallest total distance in the 4-4-2 [21,37] or the 3-5-2 [34,40] formation. No clear trend regarding the tactical formation with the highest total distance for central midfielders was observed. For wide midfielders (3 studies), the ES range was trivial to large (PD=0.27-6.89%; ES=0.07-1.48; ES not applicable for 2 studies). Wide midfielder showed the smallest total distance in 4-2-3-1 [21,37] and the largest in 4-4-2 [21,34] formation. For forwards (5 studies), the ES range was trivial to large (PD=0.08-25.32%; ES=0.02-1.00; ES not applicable for 2 studies). Forwards showed the largest total distance in 3-5-2 [35,37,40] and the smallest in 4-4-2 [21,35] formations.

High-intensity distance

The effect of the tactical formation in different playing positions on high-intensity distance (≥19.8 km/h / >19.8 km/h) was examined 7 times. For center backs (5 studies), the ES range was trivial to large (PD=2.02-30.84%; ES=0.19-1.00; ES not applicable for 2 studies). Center backs showed the highest high-intensity distance in the 3-5-2 [35,37] and the smallest in the 4-4-2 [21,34,35] formation. For full backs (4 studies), the ES was large (PD=1.17-42.76%; ES=0.33-1.57; ES not applicable for 2 studies). Full backs showed the highest high-intensity distance in 3-5-2 [35,37] and the smallest in 4-4-2 [21,35] formations. For central midfielders (4 studies), the ES range was small to large (PD=3.08-38.65%; ES=0.39-0.90; ES not applicable for 2 studies). Central midfielders showed the highest high-intensity distance in the 3-5-2 [34,37] and the smallest in the 4-4-2 [21,37] formation. For wide midfielders (3 studies), the ES was large (PD=0.97-19.27%; ES=1.33; ES not applicable for 2 studies). No clear trend regarding the tactical formation with the highest or lowest high-intensity distance for wide midfielders was observed. For forwards (5 studies), the ES range was trivial to large (PD=1.69-153.26%; ES=0.08-0.88; ES not applicable for 2 studies). Forwards showed the highest high-intensity distance in the 3-5-2 [35,37,40] or 4-4-2 [21,34] formation and the smallest in the 4-2-3-1 [21,37] formation.

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Sprinting distance

The effect of the tactical formation in different playing positions on sprinting distance (≥25.2 km/h / >25.0 km/h) was examined 4 times. For center backs (3 studies), the ES range was small to medium (PD=13.21-40.53%; ES=0.33-0.53; ES not applicable for 1 study). Center backs showed the highest sprinting distance in 3-5-2 [35,40] and the smallest in 4-4-2 [21,35] formations. For full backs (2 studies), the ES was small (PD=0.56-11.33%; ES=0.23; ES not applicable for 1 study). Full backs showed the lowest sprinting distance in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the lowest sprinting distance for full backs was observed. For central midfielders (2 studies), the ES was small (PD=6.69-77.08%; ES=0.24; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest sprinting distance for central midfielders was observed. For wide midfielders (1 study), no ES could be calculated (PD=15.79%; ES=ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest sprinting distance for wide midfielders was observed. For forwards (3 studies), the ES range was medium to large (PD=20.49-30.99%; ES=0.50-1.11; ES not applicable for 1 study). Forwards showed the highest sprinting distance in the 3-5-2 [35,40] formation. No clear trend regarding the tactical formation with the lowest sprinting distance for forwards was observed.

Number of sprints

The effect of the tactical formation in different playing positions on the number of sprints (≥25.2 km/h / >25.0 km/h) was examined 3 times. For center backs (3 studies), the ES range was trivial to medium (PD=3.13-7.60%; ES=0.18-0.57; ES not applicable for 1 study). Center backs showed the highest amount of sprints in the 3-5-2 [34,35] and the smallest amount in the 4-4-2 [34,35] formation. For full backs (2 studies), the ES range was small to large (PD=2.44-7.69%; ES=0.28-0.92; ES not applicable for 1 study). Full backs showed the fewest sprints in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the highest amount of sprints for full backs was observed. For central midfielders (3 studies), the ES range was trivial to medium (PD=0.04-12.56%; ES=0.13-0.51; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of sprints for central midfielders was observed. For wide midfielders (2 studies), the effect was large (PD=6.36-23.19%; ES=1.57; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of sprints for wide midfielders was observed. For forwards (3 studies), the ES range was trivial to medium (PD=0.26-11.95%; ES=0.01-0.54; ES not

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applicable for 1 study). Forwards showed the fewest sprints in the 4-4-2 [21,34] formation. No clear trend regarding the tactical formation with the highest amount of sprints for forwards was observed.

Number of accelerations

The effect of the tactical formation in different playing positions on the number of accelerations was examined 5 times. For center backs (4 studies), the ES range was trivial to medium (PD=3.13-7.60%; ES=0.18-0.57; ES not applicable for 1 study). Center backs showed the most accelerations in the 3-5-2 [34,35] and the least in the 4-4-2 [34,35] formation. For full backs (3 studies), the ES range was small to large (PD=2.44-7.69%; ES=0.28-0.92; ES not applicable for 1 study). Full backs showed the least accelerations in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the highest amount of accelerations for full backs was observed. For central midfielders (3 studies), the ES was large (PD=0.81-12.56%; ES=0.04-1.13; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of accelerations for central midfielders was observed. For wide midfielders (2 studies), the ES was large (PD=6.36-23.19; ES=1.57; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of accelerations for wide midfielders was observed. For forwards (4 studies), the ES range was trivial to medium (0.26-11.95%; ES=0.01-0.54; ES not applicable for 1 study). Forwards showed the least accelerations in the 4-4-2 [21,34] formation. No clear trend regarding the tactical formation with the highest amount of accelerations for forwards was observed.

Number of decelerations

The effect of the tactical formation in different playing positions on the number of decelerations was examined 4 times. For center backs (3 studies), the ES range was small to large (PD=2.90-12.50%; ES=0.28-0.97; ES not applicable for 1 study). Center backs showed the least decelerations in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the highest amount of decelerations for center backs was observed. For full backs (2 studies), the ES was medium (PD=4.11-6.29%; ES=0.73; ES not applicable for 1 study). Full backs showed the least decelerations in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the highest amount of decelerations for full backs was observed. For central midfielders (2 studies), the ES was large (PD=1.80-8.10%; ES=0.82; ES not applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of decelerations for central midfielders was observed. For wide midfielders (1 study), no ES could be calculated (PD=11.18%; ES=not applicable; ES not

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applicable for 1 study). No clear trend regarding the tactical formation with the highest and lowest amount of decelerations for wide midfielders was observed. For forwards (3 studies), the ES range was medium (PD=5.89-18.75%; ES=0.53-0.60; ES not applicable for 1 study). Forwards showed the least decelerations in the 4-4-2 [21,35] formation. No clear trend regarding the tactical formation with the highest amount of decelerations for forwards was observed.

******* (Insert Table 4 about here) *********

3.4.4 Influence of the tactical formation in different playing positions on technical match performance

1 study analyzed the effect of tactical formation in different playing positions on technical match performance (see Table 5). Therefore, a robust summary of results is not applicable.

******* (Insert Table 5 about here) *********

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4 DISCUSSION

The aim of this systematic review was to synthesize the available literature on the effects of tactical formation on physical and technical match performance of male soccer players both on a team and a positional level. Eleven studies were identified reporting match performance parameters according to different tactical formations. The main finding was that the tactical formation has an effect on soccer match performance. On a team level, the differences that occurred increase when comparing formations with three center backs (back-3) to formations with four center backs (back-4). Comparably, the differences were smaller when comparing formations that were similar in the number of defenders, midfielders, and forwards (e.g. 4-5-1, 4-2-3-1). On a positional level, the differences between formations become more pronounced. In general, the physical and technical match performance of all playing positions were similarly affected by tactical formation. However, in contrast to all other positions, the sprinting distance of full backs and central midfielders remained rather stable between formations.

4.1 Overview and study characteristics

There was high variability between the methodological approaches of the studies included in this review (e.g. tracking system, types of competition, number of formations investigated). Further, the sample sizes were relatively small in most of the studies (n ranged from 15-61 games). This can be an issue, especially when the small sample sizes are divided into groups (different formations & positions), as the number of players per group and hence the explanatory power further decreases. Moreover, some studies only investigated one or two teams what might limit the representativity of their results. Therefore, the comparability and validity of the studies are limited. Hence, the comparisons in this review are not presented in absolute numbers but in a relative manner.

Overall, the studies averaged 5 out of 7 possible points in the quality assessment, leading to a medium score of study quality. Nevertheless, the variance in the quality of the studies was high. Only one study managed to score all 7 possible points [20]. Arjol-Serrano [21], and Vilamitjana et al. [38] only reached 3 quality points leading to a low methodological quality. Like six other studies, these two did not clearly state the sample size and the number of observations for each group. This topic limits not only the single study but also the outcome measures in this review. Due to this fact, in some studies, no ES could be estimated. Further, only four studies compared more than two different tactical formations which only reflects a small part of the variety of tactical formations in soccer. All in all, this leads to restricted comparability of the studies included in this review.

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4.2 Effect of the tactical formation on performance

On a team level, ten studies investigated the effects of tactical formation on physical parameters and only three studies reported the effects of tactical formation on technical parameters.

For most of the physical parameters (total distance, jogging distance, medium-intensity distance, sprinting distance), the differences between tactical formations were of only small ES. However, tactical formation affected high-intensity distance, number of sprints, number of high-intensity actions, and the number of accelerations at least with a medium ES. For high-intensity distance, the number of sprints, as well as the number of high-intensity activities, players in a 4-4-2 showed lower physical performance than in other formations [14,33,34,37,41]. The 4-4-2 formation can be considered as the most symmetrical formation used in soccer and overall the gaps, therefore, are potentially smaller between players than in other formations (e.g. 3-5-2). Hence, for the players in a 4-4-2, it might be easier to be compact without being highly physically demanded during a game. This could be a potential explanation for these findings.

The differences between tactical formations increase when looking at the technical performance of soccer players [20,21]. When analyzing the number of passes, the effect of the tactical formation was up to large. Therefore, players tend to adapt their technical performance on a larger scale than their physical performance when changing the tactical formation.

One interesting outcome was that differences between formations increase when comparing formations with three vs. four center backs in the defending row. Some studies [38,40] only compared two formations with a back-3 and a back-4, and the differences were more pronounced compared to formations that were similar in the number of defenders, midfielders, and forwards. The difference in the number of center backs in a formation tends to be a key aspect when looking at the effects of the tactical formation on soccer match performance. Three center backs ensure higher defensive protection compared to formations with fewer center backs. The three center backs have to cover the length and the width of the field, while in other formations (e.g. 4-3-3), there are four defenders to do so. Therefore, full backs in a 3-4-3 or 3-5-2 formation can be more offensive than in classic formations with two center backs (e.g. 4-4-2). These differences tend to be one essential aspect in consideration of the influence of tactical formations on match performance.

Another obvious finding was that a comparison of similar formations (e.g. 4-5-1, 4-2-3-1) revealed only small differences in physical match performance (e.g. [20,33]). In these formations, the number of players in each positional group is equal. The formations contain two center backs, two full backs, three central midfielders, two wide midfielders, and one forward. The differences that come within

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these formations, therefore, are very small. Hence, comparing these formations leads to small differences in match performance parameters.

4.3 Effect of the tactical formation in different playing positions on performance

On a positional level, deeper insights into how tactical formations affect match performance in soccer could be revealed. When investigating not only the effect of tactical formation on performance but also consider the playing position, the explanatory power of the results increases.

For center backs, the effect of formation on total distance, high-intensity distance, and the number of decelerations was large. Only for the sprinting distance, the number of sprints, and the number of accelerations the effect was only up to medium. On the one hand, center backs showed higher physical performance in a 3-5-2 formation than in other formations. They covered more total distance, high-intensity distance, sprinting distance, and accelerated more often in this formation [34,35,37,40]. On the other hand, results reveal a lower physical performance for center backs in the 4-4-2 formation. Center backs covered less total distance, high-intensity distance, sprinting distance, and showed fewer accelerations and decelerations in a 4-4-2 [21,34,35,37].

The physical performance of full backs is affected by the formation on a large scale as well. Only the sprinting distance revealed a small effect. Full backs show greater total and high-intensity distance in a 3-5-2 formation [35,37,40] and smaller high-intensity distance, sprinting distance, and the number of decelerations in a 4-4-2 formation [21,35].

The effect of formation on physical performance for central and wide midfielders was also large for total distance, high-intensity distance, the number of accelerations and decelerations. Only the sprinting distance of wide midfielders showed a small effect. No clear trend could be observed in which formation central and wide midfielders showed the greatest or the lowest match performance.

Forwards show a large effect for total, high-intensity, and sprinting distance. For the number of sprints, accelerations, and decelerations the effect was only up to medium. Forwards showed the smallest total distance, the number of sprints, the number of accelerations, and the number of decelerations in a 4-4-2 formation [21,34,35]. However, forwards as well revealed the highest total, high-intensity, and sprinting distance in a 3-5-2 formation [35,37,40].

To sum up, it can be stated that the physical performance of all positions is influenced in a similar way (medium to high ES) by the tactical formation. Only the sprinting distance of full backs and central midfielders seems to be largely unaffected by tactical formation indicated by only trivial to small ES. Studies repeatedly revealed higher sprinting distances for full backs and lower sprinting distances for central midfielders [9,42]. If assumed that the sprinting volume of full backs is close to the highest

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sprinting distance possible for a player in one game, it could be concluded that the sprinting distances of full backs are not affected by tactical formation because the wide players sprint as much as possible in any tactical formation. Regarding central midfielders, the results of ES and PD were conflicting (i.e. small ES and large PD) and therefore this result should be treated with caution.

For all positions, higher physical match performance in 3-5-2 formations was found. The higher physical performance of players in the 3-5-2 formation could be explained by the fact, that in this formation the flanks are only covered by one player. In every other formation, the external lanes are covered by two players. In a 3-5-2 formation players possibly need to adapt to this situation by being more physically demanded.

Further, for all positions lower physical match performance in 4-4-2 formations could be revealed. A possible explanation for the lower physical performance in the 4-4-2 formation could be symmetry. As mentioned earlier, it is easier for the players to be compact in a 4-4-2 formation. Therefore, the physical demands of the 4-4-2 could be smaller than in other formations (e.g. 3-5-2). Moreover, the 4-4-2 formation is well-balanced in the number of players in each playing position. By contrast, in other formations there are different numbers of player representing each position. In the 4-4-2 formation, two players act in each of the five playing positions considered in this review. Therefore, the formation can be indicated as good balanced, which might also influence the physical performance of the players.

Only one study investigated the technical performance of varying playing positions in different tactical formations [21]. The study revealed more interceptions and clearances for center backs in a 4-4-2 formation compared to center backs in a 4-2-3-1 formation. Moreover, all positional groups (center back, full back, central midfielders, offensive midfielder, wide midfielder, forward) played more total passes and forward passes in a 4-4-2 formation compared to a 4-2-3-1 formation. Furthermore, forwards showed more goal shots in the 4-4-2 formation compared to the 4-2-3-1 formation. However, this was the only study available study regarding technical performance. Therefore, the results should be treated with caution.

The results of this review yield several practical implications that can be used by coaches and medical staff of soccer teams. When coaches play in formations that are similar (e.g. 4-5-1, 4-2-3-1), the physical match performance will likely be affected to only a small extent. By contrast, when coaches plan to play in a 3-5-2 formation they could possibly select players that can tolerate the high physical demands of this specific tactical formation. Moreover, when playing in a 4-4-2 they can anticipate lower physical demands during the match. This potential change in both external and internal load, when changing tactical formation should be considered in terms of designing training programs and the recovery process after matches.

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4.4 Limitations

The findings of this systematic review should be considered with regard to their limitations. Due to the heterogeneity of the included studies and the quality of some analyses, the conclusions of this review are only generalizable to a limited extent. Because of the wide range of included studies, it is difficult to interpret the true effect of tactical formations. While a meta-analysis would possibly help to get more expressive and meaningful results, such an analysis could not be conducted because of the heterogenous and high number of different outcome measures and various methodological approaches used in the studies included in this review. Moreover, most of the studies included in this review can be considered as observational studies rather than intervention studies (e.g. actively manipulating tactical formation in a controlled environment). Therefore, no clear causal inferences about the isolated effect of changing tactical formation can be drawn on this basis.

Addressing the limitations of the included studies, a variety of different parameters to describe physical and technical performance was used and therefore, single parameters (e.g. power score (W/kg), touches per possession) were only investigated once. This aspect is especially evident regarding studies investigating technical performance. Moreover, because there were only three studies reporting technical parameters, the results regarding technical performance are of limited generalizability. Referring to the physical performance parameters, the studies rarely used the same velocity bands to describe distances covered at jogging, intensity, high-intensity, and sprinting speeds. Therefore, the comparison between the different studies lacks consistency. As mentioned in the section referring to the study characteristics, the included studies used small sample sizes. The transferability and representativity of results, therefore, have to be questioned. Further, some studies did not report sample sizes of each relevant group. Hence, the calculation of ES was not applicable and subsequent robust statements were not possible for every study. To address this problem, we also calculated percentual differences. In addition, only three studies investigated technical parameters and therefore the results regarding technical performance are restricted. Moreover, studies compared different amounts of tactical formations. With most studies just comparing two or three different tactical formations (see Table 1), the heterogeneity of the complex reality in soccer is not portrayed. In addition, the included studies mostly compared different tactical formations and did not report any formation changes within included games. In addition, six studies respectively did not report how formations were received and how in-game formation changes were handled.

Fruitful avenues for future research would be to investigate the above-mentioned formation changes. This would lift the quality of investigations and helps to further approach the reality of the soccer game.

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With the study quality in mind, it would be helpful to rise the comparability of studies investigating match performance with regards to the tactical formation. Researchers could benefit from comparing more different and especially the same formations to extent explanatory power when comparing results between studies. Studies should clearly out roll the sample sizes for each respective group that others can re-enact the methodological procedures and further increase sample sizes to get more robust results that are generalizable. To support their results, future studies should include other contextual variables (e.g. match location, score-line, opposition quality) since they influence technical and physical match performance. Lastly, given the scarce research in technical performance, investigating the influence of tactical formations on such parameters would provide further insides in this regard.

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5 CONCLUSION

This systematic review revealed that tactical formation affects the physical and technical match performance of male soccer players.

On a team level, the largest differences between formations were observed for the comparison of formations with four defenders to formations with three defenders. By contrast, the differences between tactical formations were smaller when comparing formations that are similar considering the number of players in each playing position (e.g. defenders, midfielder & forwards in: 4-5-1, 4-2-3-1).

On a positional level, players of all positions in the 3-5-2 formation revealed higher and in the 4-4-2 formation lower physical performance. A possible explanation for these findings is that the 4-4-2 formation is balanced in the number of players acting in each playing position. In the 3-5-2 formation the flanks are only covered by one player on each side of the field, which might influence the physical performance of all positional groups. In general, all playing positions were affected in a similar way by the tactical formation. Nevertheless, the sprinting distance of full backs and central midfielders remained rather stable between formations, while more pronounced differences were found for all remaining positions.

Only 3 studies analyzed technical performance parameters and the majority of included parameters were not comparable between investigations. Hence, no clear conclusion can be drawn.

From a practical point of view, the current results can help coaches to understand the changes in the performance of players that come with changes in the tactical formation. For example, they could use the results presented in this review to design training programs and plan recovery processes in relation to the higher physical match demands when i.e. playing in a formation with three defenders. Further, clubs could scout for players with specific characteristics that match the technical and physical demands of the specific tactical formation preferred in the respective the club.

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Appendices

Supplement I. Table 1. PICOS criteria.

Supplement I. Table 2. Database search strategy and results.

Supplement II. Table 1. Descriptive values (mean ± SD) for every included article.

Supplement III. Table 1. Quality criteria.

Supplement III. Table 2. Methodological quality assessment.

Supplement IIII. PRISMA 2020 check list.

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Figure 1. Flow diagram of the search and selection strategy for inclusion of articles.

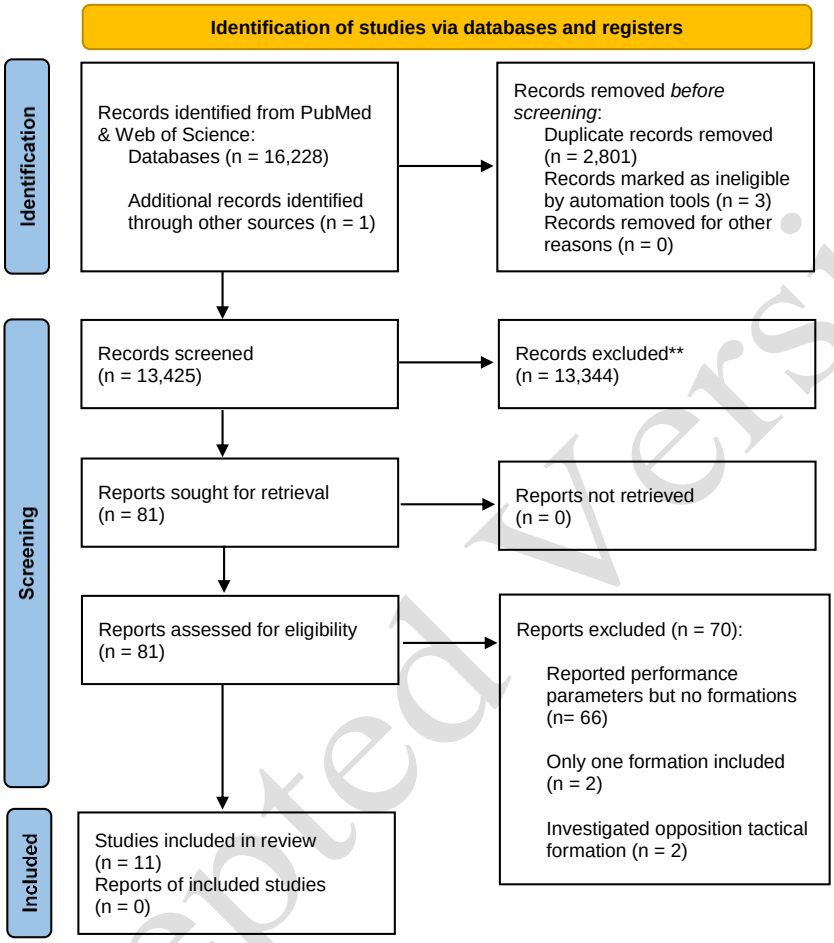
Identification of studies via databases and registers
Identification
Records identified from PubMed & Web of Science:
Databases (n = 16,228)
Additional records identified through other sources (n = 1)
Records removed *before screening*:
Duplicate records removed (n = 2,801)
Records marked as ineligible by automation tools (n = 3)
Records removed for other reasons (n = 0)
Screening
Records screened (n = 13,425)
Records excluded** (n = 13,344)
Reports sought for retrieval (n = 81)
Reports not retrieved (n = 0)
Reports assessed for eligibility (n = 81)
Reports excluded (n = 70):
Reported performance parameters but no formations (n= 66)
Only one formation included (n = 2)
Investigated opposition tactical formation (n = 2)
Included
Studies included in review (n = 11)
Reports of included studies (n = 0)

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Table 1. Study characteristics.

Article	Country	Competition	Season	Games included	Players included	Teams included	System	Company	Recording of tactical formation	Way to deal with in-game formation changes
Bradley et al. (2011)	England	FA Premier League	2006/07	20	153	10	Multiple-camera tracking	ProZone Sports Ltd.	Observation by two qualified coaches	Games with in-game formation changes were excluded
Tierney et al. (2016)	England	U18s und U21s	2014/15	43	46	2	GPS	Stat sports Newry	Not explained	Games with in-game formation changes were excluded
Aquino et al. (2017)	Brasil	Sao Paulo State Season, Brazilian season, 4th Brazilian season	2015-16	48	36	1	GPS	QSTARZ	Observation by one qualified coach	Games with in-game formation changes were excluded
Palucci Vieira et al. (2018)	Brasil	Sao Paulo First Divison, State Championship, Brazilian National Fourth divison, Brazilian National third divison	2015-17	59	40	1	GPS	QSTARZ	Not explained	Not explained
Baptista et al. (2019)	Norway	norwegian first division	2017	15	22	1	LPS	ZXY Sport	Observation by two qualified coaches	No games with in-game formation changes were found
Aquino et al. (2019)	Russia	World Cup in Russia	2018	61	Not specified	Not specified	Multi-camera tracking	STATS SportVU	Observation by two qualified scientists/aches	Observation throughout whole game time (it was not explained what happened with games with in-game formation changes)
Modric et al. (2020)	Croatia	Croation first division	2018/19	17	20	1	GPS	S7 Vector, Catapult	Not explained	Not explained

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Borghi et al. (2020)	Italy	U19s professional	2017/18	31	23	1	GPS	PlayerTek	Not explained	Not explained
Arjol Serrano et al. (2021)	Spain	Spanish 2nd division	Not specified	31	23	1	GPS & Multi-camera tracking	APEX, WyScout	Observation by two qualified coaches	Games with in-game formation changes were excluded
Riboli et al. (2021)	Italy	First division	2018	36	Not specified	19	Multi-camera tracking	Stats Perform	Not explained	Not explained
Vilamitjana et al. (2021)	Argentina	Argentina second division	2016/17	16	19	1	GPS	QSTARZ	Not explained	Not explained

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Table 2. Results of the studies examining the effect of only tactical formation on physical performance. For each performance parameter respectively, the formations are mentioned in declining order regarding the outcome values. In parenthesis, the percental differences between the respective parameter values for each formation and following the effect sizes are presented.

Article	Formation	Results		Quality score
Bradley et al. (2011)	• 4-4-2 • 4-3-3 • 4-5-1	**Parameter**	**Differences between formations (percentages; effect size)**	7/7
		total distance	4-3-3 > 4-4-2 > 4-5-1 (0.79-1.63; 0.08-0.16)	
		walking (0.7-7.1 km/h)	4-5-1 > 4-3-3 > 4-2-2 (1.51-31.82; 0.20-3.44)	
		jogging (7.2-14.3 km/h)	4-3-3 > 4-4-2 > 4-5-1 (0.33-4.44; 0.02-0.28)	
		high-intensity running (≥ 14.4 km/h)	4-3-3 > 4-4-2 > 4-5-1 (1.86-4.22; 0.07-0.15)	
		very high-intensity running (≥ 19.8 km/h)	4-4-2 > 4-3-3 > 4-5-1 (2.55-6.10; 0.07-0.18)	
		high intensive actions	4-4-2 > 4-3-3 > 4-5-1 (1.67-5.17; 0.05-0.16)	
Tierney et al. (2016)	• 4-4-2 • 4-3-3 • 3-5-2 • 3-4-3 • 4-2-3-1	**Parameter**	**Differences between formations (percentages; effect size)**	6/7
		Total distance	3-5-2 > 4-3-3 > 3-4-3 > 4-4-2 > 4-2-3-1 (0.36-4.82; 0.07-0.88)	
		High-speed running (≥19,8 km/h)	3-5-2 > 3-4-3 > 4-2-3-1 > 4-3-3 > 4-4-2 (2.42-22.59; 0.09-0.73)	
		High metabolic load distance	3-5-2 > 4-2-3-1 > 3-4-3 > 4-3-3 > 4-4-2 (1.46-22.57; 0.06-1.61)	
		Accelerations	4-2-3-1 > 3-5-2 > 4-4-2 > 4-3-3 > 3-4-3 (2.94-26.32; 0.11-1.30)	
		Decelerations	4-2-3-1 > 3-5-2 > 3-4-3 > 4-3-3 > 4-4-2 (1.96-19.67; 0.08-0.93)	

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Aquino et al. (2017)	• 4-4-2 • 4-3-3	**Parameter**	**Differences between formations (percentages; effect size)**	5/7
		Total distance	4-3-3 > 4-4-2 (10.30; not applicable)	
		maximal sprinting speed	4-3-3 > 4-4-2 (6.51; not applicable)	
		mean speed	4-3-3 > 4-4-2 (6.12; not applicable)	
		high-intensity activities	4-3-3 > 4-4-2 (28.42; not applicable)	
Palucci Vieira et al. (2018)	• 4-4-2 • 4-3-3	Parameter	Differences between formations (percentages; effect size)	6/7
		total distance	4-3-3 > 4-4-2 (5.43; 0.40)	
		maximal running speed	4-3-3 > 4-4-2 (6.02; 0.44)	
		mean speed	4-3-3 > 4-4-2 (5.77; 0.43)	
		high-intensity activities	4-3-3 > 4-4-2 (29.51; 0.64)	
Baptista et al. (2019)	• 4-5-1 • 3-5-2	Parameter	Differences between formations (percentages; effect size)	5/7
		Total distance	3-5-2 > 4-5-1 (0.38; 0.29)	
		High-intensity runs (≥19.8 km/h)	4-5-1 > 3-5-2 (9.00; 1.85)	
		High-intensity running distance (≥19.8 km/h)	4-5-1 > 3-5-2 (2.24; 0.33)	
		Sprints (≥25.2 km/h)	4-5-1 > 3-5-2 (14.00; 1.27)	
		Sprinting distance (≥25.2 km/h)	3-5-2 > 4-5-1 (1.07; 0.09)	
		Accelerations	4-5-1 > 3-5-2 (6.61; 1.43)	
		Acceleration distance	4-5-1 > 3-5-2 (4.89; 0.84)	
		Decelerations	4-5-1 > 3-5-2 (7.31; 1.49)	

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	Deceleration distance	4-5-1 > 3-5-2 (6.43; 1.12)	
	Turns	4-5-1 > 3-5-2 (10.15; 1.75)	
Aquino et al. (2019)	• 4-2-3-1 • 4-3-2-1 • 3-4-3 • 4-3-3 • 4-4-2 • 3-3-2-2	Parameter	Differences between formations (percentages; effect size)	5/7
		Total distance	3-3-2-2 > 4-2-3-1 > 3-4-3 > 4-3-3 > 4-4-2 > 4-3-2-1 (0.02-4.51; 0.00-0.19)	
		Sprints (>25 km/h)	4-3-3 > 4-2-3-1 > 3-3-2-2 > 3-4-3 > 4-3-2-1 > 4-4-2 (0.36-11.76; 0.01-0.23)	
		Maximum running speed	3-3-2-2 = 3-4-3 > 4-3-3 > 4-3-2-1 > 4-2-3-1 > 4-4-2 (0.36-2.21; 0.00-0.14)	
		Walking distance (0-7 km/h)	4-3-2-1 > 3-3-2-2 > 4-2-3-1 > 4-4-2 > 4-3-3 > 3-4-3 (0.11-12.10; 0.01-1.07)	
		Jogging distance (7.1-15 km/h)	3-3-2-2 > 4-2-3-1 > 4-3-3 > 3-4-3 > 4-4-2 > 4-3-2-1 (0.22-10.51; 0.01-0.28)	
		High-intensity running distance (15.1-20 km/h)	4-2-3-1 > 3-3-2-2 > 3-4-3 > 4-3-3 > 4-3-2-1 > 4-4-2 (0.19-8.36; 0.02-0.15)	
		Very high-intensity running distance (20.1-25 km/h)	4-2-3-1 > 4-3-3 > 4-3-2-1 > 3-3-2-2 > 3-4-3 > 4-4-2 (0.13-9.97; 0.00-0.20)	
		Sprinting distance (>25 km/h)	3-3-2-2 > 4-3-2-1 > 3-4-3 = 4-3-3 > 4-2-3-1 > 4-4-2 (0.00-25.39; 0.00-0.33)	

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Arjol-Serrano et al. (2021)	• 4-2-3-1 • 4-4-2	Parameter	Differences between formations (percentages; effect size)	3/7
		Total distance	4-2-3-1 > 4-4-2 (0.84; not applicable)	
		Distance >14.4 km/h	4-2-3-1 > 4-4-2 (2.89; not applicable)	
		Distance >19.8 km/h	4-4-2 > 4-2-3-1 (4.98; not applicable)	
		Distance >25.0 km/h	4-4-2 > 4-2-3-1 (16.78; not applicable)	
		Accelerations (2-4 ms^2)	4-2-3-1 > 4-4-2 (5.62; not applicable)	
		Accelerations (>4 ms^2)	4-4-2 > 4-2-3-1 (17.65; not applicable)	
		Decelerations (2-4 ms^2)	4-2-3-1 > 4-4-2 (8.22; not applicable)	
		Decelerations (>4 ms^2)	4-4-2 > 4-2-3-1 (6.67; not applicable)	
Vilamitjana et al. (2021)	• 3-4-3 • 4-2-3-1	Parameter	Differences between formations (percentages; effect size)	3/7
		High intensity load rate [m/min]	4-2-3-1 > 3-4-3 (7.78; not applicable)	
		High speed running/sprints load rate [m/min]	4-2-3-1 > 3-4-3 (14.10; not applicable)	
		High speed runs	3-4-3 = 4-2-3-1 (0.00; not applicable)	
		Sprints	4-2-3-1 > 3-4-3 (13.89; not applicable)	
		Mean heart rate	4-2-3-1 > 3-4-3 (0.41; not applicable)	
		Maximal heart rate	4-2-3-1 > 3-4-3 (0.21; not applicable)	
Riboli et al. (2021)	• 3-4-1-2 • 3-4-2-1 • 3-5-2 • 4-3-3	Parameter	Differences between formations (percentages; effect size)	6/7
		1 min peak: Total distance	4-4-2 > 3-4-2-1 > 4-3-3 > 3-4-1-2 > 3-5-2 (0.11-0.95; 0.01-0.07)	

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	• 4-4-2	1 min peak: High speed running distance (15-20 km/h)	4-4-2 > 3-4-2-1 > 3-5-2 = 4-3-3 > 3-4-1-2 (0.00-2.86; 0.00-0.12)	
		1 min peak: Very High speed running distance (20-24 km/h)	4-4-2 > 3-5-2 = 4-3-3 > 3-4-1-2 > 3-4-2-1 (0.00-7.07; 0.00-0.27)	
		1 min peak: Sprint distance (>20 km/h)	3-4-2-1 > 3-4-1-2 > 4-4-2 > 4-3-3 > 3-5-2 (0.51-11.11; 0.01-0.27)	
		1 min peak: Acceleration/Deceleration	3-4-2-1 > 3-4-1-2 > 3-5-2 > 4-3-3 > 4-4-2 (0.92-10.65; 0.04-0.48)	
		1 min peak: Metabolic power	3-4-2-1 > 3-4-1-2 > 3-5-2 > 4-3-3 > 4-4-2 (0.50-6.15; 0.03-0.19)	
		1 min peak: High metabolic load distance (>20 W/kg)	3-4-2-1 = 4-4-2 > 3-4-1-2 > 4-3-3 > 3-5-2 (0.00-2.15; 0.02-0.10)	
Borghi et al. (2020)	• 4-4-2 • 4-3-3 • 3-5-2	Parameter	Differences between formations (percentages; effect size)	5/7
		Total distance	4-4-2 > 3-5-2 > 4-3-3 (1.15-4.27; 0.12-0.44)	
		High speed running distance (>19.8 km/h)	3-5-2 > 4-4-2 > 4-3-3 (0.18-0.78; 0.01-0.03)	
		Powerplays (> 22 W/kg)	3-5-2 > 4-4-2 > 4-3-3 (0.07-0.85; 0.00-0.03)	
		Powerscore (W/kg)	4-4-2 > 4-3-3 > 3-5-2 (1.92-6.62; 0.21-0.76)	
		Sprints (>25 km/h)	4-3-3 > 3-5-2 > 4-4-2 (0.21-1.72; 0.01-0.05)	
		Accelerations	3-5-2 > 4-3-3 > 4-4-2 (3.19-8.42; 0.17-0.41)	

Accepted V

Table 3. Results of the studies examining the effect of only tactical formation on technical performance. For each performance parameter respectively, the formations are mentioned in declining order regarding the outcome values. In parenthesis, the percental differences between the respective parameter values for each formation and following the effect sizes are presented.

Article	Formation	Results		Quality score
Bradley et al. (2011)	4-4-2 4-3-3 4-5-1	Parameter	Differences between formations (percentages; effect size)	7/7
		passes	4-4-2 > 4-3-3 > 4-5-1 (11.46-51.42; 0.23-0.96)	
		% succesful passes	4-4-2 > 4-3-3 > 4-5-1 (2.51-11.03; 0.13-0.61)	
		Passes received	4-4-2 > 4-3-3 > 4-5-1 (11.36-37.75; 0.23-0.80)	
		Touches per possession	4-3-3 > 4-4-2 > 4-5-1 (3.85-8.33; 0.18-0.33)	
		Dribbles	4-3-3 > 4-5-1 > 4-4-2 (25.00-40.00; 0.09-0.21)	
		Final third entries	4-3-3 > 4-4-2 > 4-5-1 (6.35-14.55; 0.10-0.21)	
		Possessions won	4-4-2 > 4-3-3 > 4-5-1 (5.07-24.59; 0.10-0.41)	
		Possessions lost	4-3-3 > 4-4-2 > 4-5-1 (3.11-8.17; 0.11-0.24)	
Aquino et al. (2019)	• 4-2-3-1 • 4-3-2-1 • 3-4-3 • 4-3-3 • 4-4-2 • 3-3-2-2	Parameter	Differences between formations (percentages; effect size)	5/7
		Ball possession (%)	3-3-2-2 > 4-2-3-1 > 4-3-3 > 3-4-3 > 4-3-2-1 > 4-4-2 (1.20-15.81; 0.08-0.93)	
		Ball possession - defensive zone (%)	4-3-3 > 3-4-3 > 4-4-2 > 4-3-2-1 > 4-2-3-1 > 3-3-2-2 (0.67-22.22; 0.03-0.87)	
		Ball possession - midfield zone (%)	3-4-3 > 3-3-2-2 > 4-3-2-1 > 4-2-3-1 > 4-3-3 > 4-4-2 (0.18-12.38; 0.01-0.87)	
		Ball possession - attack zone (%)	4-2-3-1 > 4-4-2 > 3-3-2-2 > 4-3-3 = 4-3-2-1 > 3-4-3 (0.00-27.81; 0.00-0.90)	
		Completed passes	4-2-3-1 > 3-3-2-2 > 3-4-3 > 4-3-3 > 4-3-2-1 > 4-4-2 (0.08-58.51; 0.00-1.07)	
Arjol-Serrano et al. (2021)	• 4-2-3-1 • 4-4-2	Parameter	Differences between formations (percentages; effect size)	3/7
		Game volume	4-4-2 > 4-2-3-1 (16.29; not applicable)	
		Ratio interceptions-turnover	4-4-2 > 4-2-3-1 (1000.00; not applicable)	
		Defensive volume	4-4-2 > 4-2-3-1 (5.04; not applicable)	

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Interceptions	4-4-2 > 4-2-3-1 (14.29; not applicable)
Opposing pitch interceptions	4-2-3-1 = 4-4-2 (0.00; not applicable)
Defensive volume	4-4-2 > 4-2-3-1 (5.04; not applicable)
Clearances	4-4-2 > 4-2-3-1 (9.09; not applicable)
Offensive volume	4-4-2 > 4-2-3-1 (18.32; not applicable)
Total pass	4-4-2 > 4-2-3-1 (17.74; not applicable)
Long pass	4-4-2 > 4-2-3-1 (1.79; not applicable)
Short-medium pass	4-4-2 > 4-2-3-1 (19.89; not applicable)
Forward pass	4-4-2 > 4-2-3-1 (16.25; not applicable)
Attack zone pass	4-4-2 > 4-2-3-1 (2.99; not applicable)
Goal shot	4-4-2 > 4-2-3-1 (30.00; not applicable)
Crosses	4-2-3-1 > 4-4-2 (30.00; not applicable)
Dribbles	4-4-2 > 4-2-3-1 (14.29; not applicable)

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Table 4. Results of the studies examining the effect of playing positions in different tactical formations on physical performance. For each performance parameter respectively, the formations are mentioned in declining order regarding the outcome values. In parenthesis, the percental differences between the respective parameter values for each formation and following the effect sizes are presented.

Article	Formation	Position	Results			Quality score
Bradley et al. (2011)	• 4-4-2 • 4-3-3 • 4-5-1	• Defender • Midfielder • Attacker	Parameter	Position	Differences between formations (percentages; effect size)	7/7
			total distance	Defender	4-4-2 > 4-5-1 > 4-3-3 (0.49-3.76; 0.06-0.48)	
				Midfielder	4-5-1 > 4-3-3 > 4-4-2 (0.17-0.80; 0.03-0.13)	
				Attacker	4-3-3 > 4-5-1 > 4-4-2 (0.30-11.17; 0.03-1.26)	
			High-intensive actions	Defender	4-4-2 > 4-3-3 > 4-5-1 (5.38-19.35; 0.14-0.51)	
				Midfielder	4-5-1 > 4-4-2 > 4-3-3 (0.68-8.96; 0.03-0.43)	
				Attacker	4-3-3 > 4-4-1 > 4-5-1 (1.85-31.48; 0.08-1.12)	
			Recovery time	Defender	4-5-1 > 4-3-3 > 4-4-2 (4.29-20.00; 0.11-0.59)	
				Midfielder	4-3-3 > 4-5-1 > 4-4-2 (4.88-11.36; 0.21-0.56)	
				Attacker	4-5-1 > 4-4-2 > 4-3-3 (3.64-26.19; 0.15-0.93)	
			high-intensity running (≥ 14.4 km/h)	Defender	4-4-2 > 4-3-3 > 4-5-1 (0.50-11.19; 0.14-0.51)	
				Midfielder	4-5-1 > 4-4-2 > 4-3-3 (1.90-6.05; 0.03-0.43)	
				Attacker	4-3-3 > 4-5-1 > 4-4-2 (3.56-28.08; 0.08-1.12)	
			very high-intensity running (≥ 19.8 km/h)	Defender	4-4-2 > 4-3-3 > 4-5-1 (0.40-15.24; 0.01-0.38)	
				Midfielder	4-4-2 > 4-5-1 > 4-3-3 (1.36-13.50; 0.06-0.48)	
				Attacker	4-3-3 > 4-4-1 > 4-5-1 (9.20-32.76; 0.35-1.24)	
Tierney et al. (2016)	• 4-4-2 • 4-3-3 • 3-5-2 • 3-4-3 • 4-2-3-1	• Center back • Full back • Central midfielder • Wide midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)	6/7
			Total distance	Center back	3-5-2 > 4-4-2 > 4-2-3-1 > 3-4-3 > 4-3-3 (0.35-8.64; not applicable)	
				Full back	3-5-2 > 4-2-3-1 > 4-3-3 > 4-4-2 > 3-4-3 (1.40-9.14; not applicable)	
				Central midfielder	3-5-2 > 4-3-3 > 3-4-3 > 4-2-3-1 > 4-4-2 (0.12-7.25; not applicable)	

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				Wide midfielder	4-3-3 > 3-5-2 > 4-4-2 > 3-4-3 > 4-2-3-1 (0.46-6.98; not applicable)
				Forward	3-5-2 > 3-4-3 > 4-3-3 > 4-4-2 > 4-2-3-1 (0.11-25.31; not applicable)
			High-speed running (≥19,8 km/h)	Center back	3-5-2 > 4-2-3-1 > 3-4-3 > 4-4-2 > 4-3-3 (3.45-22.49; not applicable)
				Full back	3-5-2 > 4-2-3-1 > 4-3-3 > 4-4-2 > 3-4-3 (1.17-42.76; not applicable)
				Central midfielder	3-5-2 > 4-2-3-1 > 3-4-3 > 4-3-3 > 4-4-2 (3.08-38.65; not applicable)
				Wide midfielder	3-4-3 > 4-3-3 > 4-2-3-1 > 3-5-3 > 4-4-2 (0.97-16.57; not applicable)
				Forward	3-5-2 > 4-3-3 > 3-4-3 > 4-4-2 > 4-2-3-1 (10.29-153.26; not applicable)
			High metabolic load distance	Center back	3.5.2 > 4-2-3-1 > 3-4-3 > 4-3-3 > 4-4-2 (1.75-19.18; not applicable)
				Full back	3-5-2 > 4-2-3-1 > 4-3-3 > 3-4-3 > 4-4-2 (1.49-24.30; not applicable)
				Central midfielder	4-2-3-1 > 3-4-3 > 3-5-2 > 4-3-3 > 4-4-2 (1.14-30.80; not applicable)
				Wide midfielder	3-4-3 > 4-2-3-1 > 3-5-2 > 4-3-3 > 4-4-2 (2.27-14.40; not applicable)
				Forward	3-5-2 > 4-3-3 > 3-4-3 > 4-4-2 > 4-2-3-1 (6.45-60.95; not applicable)
Aquino et al. (2017)	• 4-4-2 • 4-3-3	• Center back • Full back • Central midfielder • Wide midfielder • Forwards	Parameter	Position	Differences between formations (percentages; effect size)
			Maximal running speed	Center back	4-3-3 > 4-4-2 (5.05; not applicable)
				Full back	4-3-3 > 4-4-2 (4.95; not applicable)
				Central midfielder	4-3-3 > 4-4-2 (4.84; not applicable)
				Wide midfielder	4-3-3 > 4-4-2 (4.75; not applicable)
				Forward	4-3-3 > 4-4-2 (4.65; not applicable)
			high-intensity activities	Center back	4-3-3 > 4-4-2 (35.11; not applicable)
				Full back	4-3-3 > 4-4-2 (31.49; not applicable)
				Central midfielder	4-3-3 > 4-4-2 (28.50; not applicable)

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				Wide midfielder	4-3-3 > 4-4-2 (26.07; not applicable)
				Forward	4-3-3 > 4-4-2 (24.02; not applicable)
Baptista et al. (2019)	• 4-5-1 • 3-5-2	• Center back • Wide positions • Central midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)
			Total distance	Center back	4-5-1 > 3-5-2 (2.58; 1.21)
				Wide positions	3-5-2 > 4-5-1 (2.70; 1.48)
				Central midfielder	4-5-1 > 3-5-2 (1.59; 0.83)
				Forward	3-5-2 > 4-5-1 (0.08; 0.03)
			High-intensity runs (≥19.8 km/h)	Center back	4-5-1 > 3-5-2 (28.01; 2.26)
				Wide positions	3-5-2 > 4-5-1 (2.13; 0.35)
				Central midfielder	4-5-1 > 3-5-2 (7.84; 0.85)
				Forward	4-5-1 > 3-5-2 (3.18; 0.32)
			High-intensity running distance (≥19.8 km/h)	Center back	4-5-1 > 3-5-2 (18.79; 1.00)
				Wide positions	3-5-2 > 4-5-1 (14.15; 2.09)
				Central midfielder	4-5-1 > 3-5-2 (5.29; 0.43)
				Forward	3-5-2 > 4-5-1 (10.24; 0.88)
			Sprints (≥25.2 km/h)	Center back	4-5-1 > 3-5-2 (22.22; 0.63)
				Wide positions	4-5-1 > 3-5-2 (0.71; 0.07)
				Central midfielder	4-5-1 = 3-5-2 (0.00; 0.00)
				Forward	3-5-2 > 4-5-1 (8.59; 0.53)
			Sprinting distance (≥25.2 km/h)	Center back	3-5-2 > 4-5-1 (13.21; 0.33)
				Wide positions	3-5-2 > 4-5-1 (17.56; 1.73)
				Central midfielder	4-5-1 > 3-5-2 (6.96; 0.24)
				Forward	3-5-2 > 4-5-1 (21.10; 1.11)
			Accelerations	Center back	4-5-1 > 3-5-2 (5.86; 0.57)
				Wide positions	4-5-1 > 3-5-2 (8.33; 1.27)
				Central midfielder	4-5-1 > 3-5-2 (11.45; 1.13)
				Forward	4-5-1 > 3-5-2 (3.37; 0.33)
			Acceleration distance	Center back	4-5-1 > 3-5-2 (6.09; 0.50)
				Wide positions	4-5-1 > 3-5-2 (3.38; 0.50)
				Central midfielder	4-5-1 > 3-5-2 (8.18; 0.71)
				Forward	4-5-1 > 3-5-2 (1.19; 0.12)
			Decelerations	Center back	4-5-1 > 3-5-2 (12.50; 0.97)

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				Wide positions	4-5-1 > 3-5-2 (0.93; 0.14)
				Central midfielder	4-5-1 > 3-5-2 (8.10; 0.82)
				Forward	4-5-1 > 3-5-2 (6.68; 0.53)
			Deceleration distance	Center back	4-5-1 > 3-5-2 (15.33; 1.03)
				Wide positions	3-5-2 > 4-5-1 (0.83; 0.13)
				Central midfielder	4-5-1 > 3-5-2 (9.91; 0.85)
				Forward	3-5-2 > 4-5-1 (2.00; 0.17)
			turns	Center back	4-5-1 > 3-5-2 (24.81; 1.86)
				Wide positions	4-5-1 > 3-5-2 (8.51; 1.04)
				Central midfielder	3-5-2 > 4-5-1 (13.90; 1.59)
				Forward	4-5-1 > 3-5-2 (23.91; 1.39)
Modric et al. (2020)	• 3-5-2 / 3-4-1-2 • 4-4-2 / 4-2-3-2	• Center back • Full back • Midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)
			Total distance	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (2.18; 1.31)
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (8.65; 5.58)
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (2.74; 1.72)
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (6.85; 3.35)
			High-intensity running distance (>19.8 km/h)	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (30.84; 0.74)
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (34.86; 1.57)
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (15.55; 0.54)
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (15.11; 0.60)
			High-speed running distance (19.8-25.1 km/h)	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (28.78; 0.78)
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (44.36; 2.53)
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (20.43; 0.75)
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (15.00; 0.62)
			Sprinting distance (≥25.2 km/h)	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (40.53; 0.53)
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (11.33; 0.23)
				Midfielder	4-4-2/4-1-3-1 > 3-5-2/3-4-1-2 (9.31; 0.19)
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (20.49; 0.50)
			Accelerations	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (3.13; 0.30)
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (7.69; 0.92)
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (9.95; 1.46)
				Forward	4-4-2/4-1-3-1 > 3-5-2/3-4-1-2 (0.26; 0.01)
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			Decelerations	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (2.90; 0.28)	
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (6.29; 0.73)	
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (9.53; 1.41)	
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (5.89; 0.60)	
			High-intensity accelerations	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (16.75; 0.36)	
				Full back	4-4-2/4-1-3-1 > 3-5-2/3-4-1-2 (11.43; 0.40)	
				Midfielder	4-4-2/4-1-3-1 > 3-5-2/3-4-1-2 (8.02; 0.21)	
				Forward	4-4-2/4-1-3-1 > 3-5-2/3-4-1-2 (7.33; 0.23)	
			High-intensity decelerations	Center back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (28.06; 0.77)	
				Full back	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (14.32; 0.57)	
				Midfielder	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (18.89; 0.67)	
				Forward	3-5-2/3-4-1-2 > 4-4-2/4-1-3-1 (7.77; 0.35)	
Arjol-Serrano et al. (2021)	• 4-2-3-1 • 4-4-2	• Center back • Full back • Central midfielder • Wide midfielder • Offensive midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)	3/7
			Total distance	Center back	4-2-3-1 > 4-4-2 (0.11; not applicable)	
				Full back	4-4-2 > 4-2-3-1 (1.39; not applicable)	
				Central midfielder	4-2-3-1 > 4-4-2 (5.32; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (2.32; not applicable)	
				Offensive midfielder	4-2-3-1 > 4-4-2 (4.24; not applicable)	
				Forward	4-2-3-1 > 4-4-2 (0.23; not applicable)	
			Distance >14.4 km/h	Center back	4-2-3-1 > 4-4-2 (7.20; not applicable)	
				Full back	4-2-3-1 > 4-4-2 (1.72; not applicable)	
				Central midfielder	4-2-3-1 > 4-4-2 (22.72; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (14.39; not applicable)	
				Offensive midfielder	4-2-3-1 > 4-4-2 (1.19; not applicable)	
				Forward	Unrealistic results	
			Distance >19.8 km/h	Center back	4-2-3-1 > 4-4-2 (2.02; not applicable)	
				Full back	4-2-3-1 > 4-4-2 (5.40; not applicable)	
				Central midfielder	4-2-3-1 > 4-4-2 (32.01; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (15.37; not applicable)	
				Offensive midfielder	4-2-3-1 > 4-4-2 (1.42; not applicable)	

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	Forward	4-4-2 > 4-2-3-1 (11.27; not applicable)
Distance >25.0 km/h	Center back	4-2-3-1 > 4-4-2 (13.24; not applicable)
	Full back	4-2-3-1 > 4-4-2 (0.56; not applicable)
	Central midfielder	4-2-3-1 > 4-4-2 (77.08; not applicable)
	Wide midfielder	4-4-2 > 4-2-3-1 (15.79; not applicable)
	Offensive midfielder	4-4-2 > 4-2-3-1 (20.47; not applicable)
	Forward	4-4-2 > 4-2-3-1 (30.99; not applicable)
Accelerations (2-4 ms^2)	Center back	4-2-3-1 > 4-4-2 (3.13; not applicable)
	Full back	4-2-3-1 > 4-4-2 (2.44; not applicable)
	Central midfielder	4-4-2 > 4-2-3-1 (1.83; not applicable)
	Wide midfielder	4-4-2 > 4-2-3-1 (6.36; not applicable)
	Offensive midfielder	4-2-3-1 > 4-4-2 (31.18; not applicable)
	Forward	4-2-3-1 > 4-4-2 (11.95; not applicable)
Accelerations (>4 ms^2)	Center back	4-4-2 > 4-2-3-1 (7.14; not applicable)
	Full back	4-4-2 > 4-2-3-1 (21.05; not applicable)
	Central midfielder	4-4-2 > 4-2-3-1 (42.86; not applicable)
	Wide midfielder	4-4-2 > 4-2-3-1 (13.33; not applicable)
	Offensive midfielder	4-2-3-1 > 4-4-2 (29.41; not applicable)
	Forward	4-2-3-1 = 4-4-2 (0.00; not applicable)
Decelerations (2-4 ms^2)	Center back	4-2-3-1 > 4-4-2 (4.29; not applicable)
	Full back	4-2-3-1 > 4-4-2 (4.11; not applicable)
	Central midfielder	4-2-3-1 > 4-4-2 (1.80; not applicable)
	Wide midfielder	4-4-2 > 4-2-3-1 (11.18; not applicable)
	Offensive midfielder	4-2-3-1 > 4-4-2 (9.77; not applicable)
	Forward	4-2-3-1 > 4-4-2 (18.75; not applicable)
Decelerations (>4 ms^2)	Center back	4-4-2 > 4-2-3-1 (17.39; not applicable)
	Full back	4-4-2 > 4-2-3-1 (5.71; not applicable)
	Central midfielder	4-4-2 > 4-2-3-1 (12.00; not applicable)
	Wide midfielder	4-4-2 > 4-2-3-1 (2.94; not applicable)
	Offensive midfielder	4-2-3-1 > 4-4-2 (15.38; not applicable)

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				Forward	4-2-3-1 > 4-4-2 (3.23; not applicable)	
Borghi et al. (2020)	• 4-4-2 • 4-3-3 • 3-5-2	• Center back • Full back • Central midfielder • Wide midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)	5/7
			Total distance	Center back	3-5-2 > 4-4-2 > 4-3-3 (0.41-5.51; 0.08-0.99)	
				Full back	4-4-2 > 4-3-3 (4.62; 0.96)	
				Central midfielder	4-4-2 > 4-3-3 > 3-5-2 (0.17-1.57; 0.02-0.24)	
				Wide midfielder	4-4-2 > 3-5-2 (0.27; 0.07)	
				Forward	4-4-2 > 4-3-3 > 3-5-2 (0.21-8.05; 0.02-1.00)	
			High speed running distance (>19.8 km/h)	Center back	4-3-3 > 3-5-2 > 4-4-2 (4.34-9.38; 0.19-0.36)	
				Full back	4-4-2 > 4-3-3 (5.71; 0.33)	
				Central midfielder	3-5-2 > 4-4-2 > 4-3-3 (8.89-20.82; 0.39-0.90)	
				Wide midfielder	3-5-2 > 4-4-2 (19.27; 1.33)	
				Forward	4-4-2 > 4-3-3 > 3-5-2 (1.69-7.45; 0.08-0.41)	
			Powerplays (> 22 W/kg)	Center back	3-5-2 > 4-3-3 > 4-4-2 (0.97-8.86; 0.07-0.47)	
				Full back	4-4-2 > 4-3-3 (4.29; 0.34)	
				Central midfielder	3-5-2 > 4-4-2 > 4-3-3 (2.05-4.50; 0.12-0.25)	
				Wide midfielder	4-4-2 = 3-5-2 (0.00; 0.00)	
				Forward	4-4-2 > 4-3-3 > 3-5-2 (5.26-11.98; 0.26-0.91)	
			Powerscore (W/kg)	Center back	4-4-2 > 3-5-2 > 4-3-3 (1.39-4.47; 0.23-0.78)	
				Full back	4-4-2 > 4-3-3 (7.90; 1.65)	
				Central midfielder	3-5-2 > 4-4-2 > 4-3-3 (0.63-3.26; 0.12-0.54)	
				Wide midfielder	3-5-2 > 4-4-2 (1.55; 0.33)	
				Forward	4-4-2 > 3-5-2 > 4-3-3 (0.42-4.00; 0.05-0.51)	
			Sprints (>25 km/h)	Center back	4-3-3 > 3-5-2 > 4-4-2 (2.27-11.38; 0.10-0.43)	
				Full back	4-4-2 > 4-3-3 (5.89; 0.30)	
				Central midfielder	3-5-2 > 4-4-2 > 4-3-3 (4.05-14.29; 0.13-0.51)	
				Wide midfielder	3-5-2 > 4-4-2 (23.19; 1.57)	
				Forward	4-4-2 > 4-3-3 > 3-5-2 (3.88-9.05; 0.18-0.54)	
			Accelerations	Center back	3-5-2 > 4-3-3 > 4-4-2 (3.08-7.60; 0.18-0.46)	
				Full back	4-4-2 > 4-3-3 (4.78; 0.28)	
				Central midfielder	3-5-2 > 4-3-3 > 4-4-2 (0.81-12.56; 0.04-0.80)	
				Wide midfielder	3-5-2 > 4-4-2 (23.19; 1.57)	
				Forward	4-3-3 > 3-5-2 > 4-4-2 (3.88-9.05; 0.18-0.54)	

Vilamitjana et al. (2021)	• 3-4-3 • 4-2-3-1	• Center back • Full back • Central midfielder • Wide midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)	3/7
			High intensity load rate [m/min]	Center back	4-2-3-1 > 3-4-3 (13.89; not applicable)	
				Full back	3-4-3 > 4-2-3-1 (0.42; not applicable)	
				Central midfielder	4-2-3-1 > 3-4-3 (9.95; not applicable)	
				Wide midfielder	4-2-3-1 > 3-4-3 (1.67; not applicable)	
				Forward	4-2-3-1 > 3-4-3 (24.15; not applicable)	
			High speed running/sprints load rate [m/min]	Center back	4-2-3-1 > 3-4-3 (26.67; not applicable)	
				Full back	4-2-3-1 > 3-4-3 (6.90; not applicable)	
				Central midfielder	4-2-3-1 > 3-4-3 (3.85; not applicable)	
				Wide midfielder	4-2-3-1 > 3-4-3 (6.93; not applicable)	
				Forward	4-2-3-1 > 3-4-3 (40.19; not applicable)	
			High speed runs	Center back	3-4-3 > 4-2-3-1 (4.21; not applicable)	
				Full back	4-2-3-1 > 3-4-3 (0.40; not applicable)	
				Central midfielder	4-2-3-1 > 3-4-3 (6.08; not applicable)	
				Wide midfielder	4-2-3-1 > 3-4-3 (21.40; not applicable)	
				Forward	3-4-3 > 4-2-3-1 (4.09; not applicable)	
			Sprints	Center back	4-2-3-1 > 3-4-3 (17.65; not applicable)	
				Full back	4-2-3-1 > 3-4-3 (6.49; not applicable)	
				Central midfielder	4-2-3-1 > 3-4-3 (5.13; not applicable)	
				Wide midfielder	4-2-3-1 > 3-4-3 (37.21; not applicable)	
				Forward	4-2-3-1 > 3-4-3 (18.02; not applicable)	
			Mean heart rate	Center back	4-2-3-1 > 3-4-3 (1.41; not applicable)	
				Full back	3-4-3 > 4-2-3-1 (1.15; not applicable)	
				Central midfielder	3-4-3 > 4-2-3-1 (1.78; not applicable)	
				Wide midfielder	4-2-3-1 > 3-4-3 (0.31; not applicable)	
				Forward	3-4-3 > 4-2-3-1 (0.41; not applicable)	
			Maximal heart rate	Center back	4-2-3-1 > 3-4-3 (0.63; not applicable)	
				Full back	3-4-3 > 4-2-3-1 (0.67; not applicable)	
				Central midfielder	4-2-3-1 > 3-4-3 (0.97; not applicable)	
				Wide midfielder	3-4-3 > 4-2-3-1 (1.65; not applicable)	
				Forward	4-2-3-1 > 3-4-3 (1.17; not applicable)	
Riboli et al. (2021)	• 3-4-1-2	• Center back	Parameter	Position	Differences between formations (percentages; effect size)	6/7

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• 3-4-2-1 • 3-5-2 • 4-3-3 • 4-4-2	• Full back • Central midfielder • Wide midfielder • Wide forward • Forward	Total distance [1 min peak]	Center back	4-4-2 > 3-4-1-2 > 3-4-2-1 > 4-3-3 > 3-5-2 (0.33-5.21; 0.02-0.31)
			Full back	3-4-2-1 > 4-4-2 > 3-5-2 > 4-3-3 > 3-4-1-2 (1.01-20.65; 0.15-1.51)
			Central midfielder	3-4-1-2 > 4-4-2 > 4-3-3 > 3-5-2 > 3-4-2-1 (0.05-5.79; 0.01-0.41)
			Wide midfielder	3-4-2-1 > 3-5-2 > 4-3-3 > 3-4-1-2 > 4-4-2 (0.42-5.31; 0.03-0.46)
			Wide forward	3-5-2 > 4-3-3 > 4-4-2 > 3-4-1-2 > 3-4-2-1 (0.70-9.41; 0.08-1.14)
			Forward	4-3-3 > 4-4-2 > 3-5-2 > 3-4-2-1 > 3-4-1-2 (0.39-4.74; 0.02-0.26)
		High speed running distance (15-20 km/h) [1 min peak]	Center back	4-4-2 > 3-4-1-2 > 3-5-2 > 4-3-3 > 3-4-2-1 (0.21-6.67; 0.01-0.40)
			Full back	4-4-2 > 3-4-2-1 > 3-5-2 > 4-3-3 > 3-4-1-2 (5.34-28.19; 0.20-1.62)
			Central midfielder	3-4-1-2 > 4-4-2 > 4-3-3 > 3-5-2 > 3-4-2-1 (1.17-14.71; 0.06-0.69)
			Wide midfielder	3-4-2-1 > 3-4-1-2 > 4-4-2 > 3-5-2 > 4-3-3 (0.46-19.16; 0.04-0.55)
			Wide forward	4-3-3 > 4-4-2 > 3-4-2-1 > 3-5-2 > 3-4-1-2 (0.18-24.54; 0.01-2.11)
			Forward	4-4-2 > 4-3-3 > 3-5-2 > 3-4-2-1 > 3-4-1-2 (0.67-15.05; 0.02-0.54)
		Very High speed running distance (20-24 km/h) [1 min peak]	Center back	4-4-2 > 3-5-2 > 3-4-2-1 = 4-3-3 > 3-4-1-2 (0.00-6.37; 0.00-0.24)
			Full back	3-4-2-1 > 4-4-2 > 3-5-2 > 4-3-3 > 3-4-1-2 (6.15-36.08; 0.22-1.26)
			Central midfielder	4-4-2 > 4-3-3 > 3-4-1-2 > 3-5-2 > 3-4-2-1 (0.75-17.63; 0.03-0.55)
			Wide midfielder	4-4-2 = 3-5-2 > 3-4-2-1 > 4-3-3 > 3-4-1-2 (0.00-4.80; 0.00-0.16)
			Wide forward	4-3-3 > 3-5-2 > 4-4-2 > 3-4-1-2 > 3-4-1-2 (3.78-23.40; 0.13-1.06)
			Forward	4-3-3 > 4-4-2 > 3-5-2 > 3-4-1-2 > 3-4-2-1

			(1.41-22.49; 0.04-0.70)
	Sprint distance (>24 km/h) [1 min peak]	Center back	4-4-2 > 3-4-2-1 > 3-4-1-2 > 3-5-2 > 4-3-3 (0.84-19.64; 0.02-0.52)
		Full back	3-4-2-1 > 4-4-2 > 4-3-3 > 3-5-2 > 3-4-1-2 (0.62-26.86; 0.02-0.74)
		Central midfielder	3-4-1-2 > 3-4-2-1 > 3-5-2 > 4-3-3 > 4-4-2 (1.51-21.08; 0.04-0.43)
		Wide midfielder	4-3-3 > 3-4-2-1 = 3-4-1-2 > 3-5-2 = 4-4-2 (0.00-20.86; 0.00-0.56)
		Wide forward	3-4-2-1 > 4-3-3 > 3-5-2 > 3-4-1-2 > 4-4-2 (0.66-32.66; 0.02-0.72)
		Forward	3-4-2-1 > 4-4-2 > 4-3-3 > 3-5-2 > 3-4-1-2 (0.78-9.02; 0.02-0.19)
	Acceleration /Deceleration [1 min peak]	Center back	3-5-2 > 3-4-2-1 > 4-4-2 > 4-3-3 > 3-4-1-2 (0.91-23.94; 0.05-1.75)
		Full back	3-5-2 > 4-3-3 > 4-4-2 > 3-4-2-1 > 3-4-1-2 (0.32-40.24; 0.01-1.78)
		Central midfielder	4-3-3 > 3-4-2-1 > 3-5-2 > 4-4-2 > 3-4-1-2 (1.92-36.58; 0.09-2.74)
		Wide midfielder	4-3-3 > 3-5-2 > 3-4-2-1 > 4-4-2 > 3-4-1-2 (4.09-35.64; 0.20-2.04)
		Wide forward	3-5-2 > 4-3-3 > 3-4-2-1 > 4-4-2 > 3-4-1-2 (2.64-27.70; 0.13-1-95)
		Forward	4-3-3 > 4-4-2 > 3-4-2-1 > 3-5-2 > 3-4-1-2 (0.63-28.72; 0.03-1.34)
	Avergae metabolic power [1 min peak]	Center back	3-4-2-1 > 3-4-1-2 > 4-3-3 > 4-4-2 > 3-5-2 (0.52-2.67; 0.03-0.18)
		Full back	3-4-2-1 > 4-3-3 > 4-4-2 = 3-5-2 > 3-4-1-2 (0.00-16.59; 0.00-1.13)
		Central midfielder	3-4-1-2 > 3-5-2 > 4-3-3 > 4-4-2 = 3-4-2-1 (0.00-5.97; 0.00-0.30)
		Wide midfielder	3-4-2-1 > 3-5-2 > 4-3-3 > 3-4-1-2 > 4-4-2 (0.48-22.45; 0.03-1.14)
		Wide forward	3-5-2 > 4-3-3 > 3-4-2-1 > 3-4-1-2 > 4-4-2 (0.51-14.87; 0.05-1.17)

		Forward	3-4-2-1 > 4-4-2 > 3-4-1-2 > 3-5-2 = 4-3-3 (0.00-3.16; 0.00-0.14)
	High metabolic load distance (>20 W/kg) [1 min peak]	Center back	4-4-2 > 3-4-2-1 > 3-4-1-2 > 3-5-2 > 4-3-3 (0.70-4.48; 0.03-0.21)
		Full back	3-4-2-1 > 4-4-2 > 3-5-2 > 4-3-3 > 3-4-1-2 (3.35-34.84; 0.23-1.67)
		Central midfielder	3-4-1-2 > 4-4-2 > 4-3-3 > 3-5-2 > 3-4-2-1 (0.48-10.04; 0.03-0.48)
		Wide midfielder	3-4-2-1 > 4-4-2 > 3-4-1-2 > 4-3-3 > 3-5-2 (0.59-12.45; 0.03-0.49)
		Wide forward	3-5-2 > 4-3-3 > 3-4-2-1 > 4-4-2 > 3-4-1-2 (1.84-17.80; 0.10-1.25)
		Forward	4-3-3 > 4-4-2 > 3-5-2 > 3-4-1-2 > 3-4-2-1 (0.85-6.24; 0.03-0.22)

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Table 5. Results of the studies examining the effect of playing positions in different tactical formations on technical performance. For each performance parameter respectively, the formations are mentioned in declining order regarding the outcome values. In parenthesis, the percental differences between the respective parameter values for each formation and following the effect sizes are presented.

Article	Formation	Position	Results			Quality score
Arjol-Serrano et al. (2021)	• 4-2-3-1 • 4-4-2	• Center back • Full back • Central midfielder • Wide midfielder • Offensive midfielder • Forward	Parameter	Position	Differences between formations (percentages; effect size)	3/7
			Game volume	Center back	4-4-2 > 4-2-3-1 (4.30; not applicable)	
				Full back	4-4-2 > 4-2-3-1 (12.72; not applicable)	
				Central midfielder	4-4-2 > 4-2-3-1 (32.34; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (27.75; not applicable)	
				Offensive midfielder	4-4-2 > 4-2-3-1 (41.44; not applicable)	
				Forward	4-4-2 > 4-2-3-1 (21.25; not applicable)	
			Ratio interceptions-turnover	Center back	4-4-2 > 4-2-3-1 (29.41; not applicable)	
				Full back	4-4-2 > 4-2-3-1 (100.00; not applicable)	
				Central midfielder	4-4-2 > 4-2-3-1 (47.50; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (642.86; not applicable)	
				Offensive midfielder	4-2-3-1 > 4-4-2 (52.38; not applicable)	
				Forward	4-4-2 > 4-2-3-1 (40.35; not applicable)	
			Defensive volume	Center back	4-2-3-1 > 4-4-2 (4.64; not applicable)	
				Full back	4-2-3-1 > 4-4-2 (5.22; not applicable)	
				Central midfielder	4-4-2 > 4-2-3-1 (9.33; not applicable)	
				Wide midfielder	4-4-2 > 4-2-3-1 (34.38; not applicable)	
				Offensive midfielder	4-4-2 > 4-2-3-1 (16.67; not applicable)	
				Forward	4-4-2 > 4-2-3-1 (40.35; not applicable)	
			Interceptions	Center back	4-4-2 > 4-2-3-1 (8.47; not applicable)	
				Full back	4-4-2 > 4-2-3-1 (1.72; not applicable)	
				Central midfielder	4-4-2 > 4-2-3-1 (19.42; not applicable)	

		Wide midfielder	4-4-2 > 4-2-3-1 (28.21; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (66.18; not applicable)
		Forward	4-4-2 > 4-2-3-1 (60.00; not applicable)
	Opposing pitch interceptions	Center back	4-2-3-1 > 4-4-2 (16.67; not applicable)
		Full back	4-2-3-1 > 4-4-2 (33.33; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (15.38; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (50.00; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (38.10; not applicable)
		Forward	4-4-2 > 4-2-3-1 (20.00; not applicable)
	Clearances	Center back	4-4-2 > 4-2-3-1 (3.13; not applicable)
		Full back	4-2-3-1 = 4-4-2 (0.00; not applicable)
		Central midfielder	4-2-3-1 = 4-4-2 (0.00; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (21.74; not applicable)
		Offensive midfielder	4-2-3-1 = 4-4-2 (0.00; not applicable)
		Forward	4-4-2 > 4-2-3-1 (27.27; not applicable)
	Offensive volume	Center back	4-4-2 > 4-2-3-1 (6.34; not applicable)
		Full back	4-4-2 > 4-2-3-1 (16.48; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (39.42; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (22.61; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (36.82; not applicable)
		Forward	4-4-2 > 4-2-3-1 (17.11; not applicable)
	Total pass	Center back	4-4-2 > 4-2-3-1 (7.11; not applicable)
		Full back	4-4-2 > 4-2-3-1 (16.50; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (38.60; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (28.32; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (34.78; not applicable)
		Forward	4-4-2 > 4-2-3-1 (14.02; not applicable)
	Long pass	Center back	4-2-3-1 > 4-4-2 (24.29; not applicable)
		Full back	4-4-2 > 4-2-3-1 (12.68; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (24.73; not applicable)

		Wide midfielder	4-4-2 > 4-2-3-1 (47.83; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (10.71; not applicable)
		Forward	4-4-2 > 4-2-3-1 (46.67; not applicable)
	Short-medium pass	Center back	4-4-2 > 4-2-3-1 (13.31; not applicable)
		Full back	4-4-2 > 4-2-3-1 (16.55; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (40.94; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (26.11; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (35.75; not applicable)
		Forward	4-4-2 > 4-2-3-1 (11.56; not applicable)
	Forward pass	Center back	4-4-2 > 4-2-3-1 (5.64; not applicable)
		Full back	4-4-2 > 4-2-3-1 (18.54; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (38.56; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (28.79; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (30.45; not applicable)
		Forward	4-4-2 > 4-2-3-1 (3.09; not applicable)
	Attack zone pass	Center back	4-2-3-1 > 4-4-2 (60.00; not applicable)
		Full back	4-4-2 > 4-2-3-1 (10.28; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (39.13; not applicable)
		Wide midfielder	4-2-3-1 > 4-4-2 (63.89; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (11.76; not applicable)
		Forward	4-4-2 > 4-2-3-1 (8.24; not applicable)
	Goal shot	Center back	4-2-3-1 = 4-4-2 (0.00; not applicable)
		Full back	4-4-2 > 4-2-3-1 (50.00; not applicable)
		Central midfielder	4-2-3-1 > 4-4-2 (80.00; not applicable)
		Wide midfielder	4-4-2 > 4-2-3-1 (38.46; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (5.26; not applicable)
		Forward	4-4-2 > 4-2-3-1 (42.86; not applicable)
	Crosses	Center back	Unrealistic results
		Full back	4-2-3-1 > 4-4-2 (14.29; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (44.83; not applicable)

		Wide midfielder	4-2-3-1 > 4-4-2 (157.14; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (42.86; not applicable)
		Forward	4-4-2 > 4-2-3-1 (33.33; not applicable)
	Dribbles	Center back	4-2-3-1 > 4-4-2 (200.00; not applicable)
		Full back	4-4-2 > 4-2-3-1 (11.76; not applicable)
		Central midfielder	4-4-2 > 4-2-3-1 (14.29; not applicable)
		Wide midfielder	4-2-3-1 > 4-4-2 (41.18; not applicable)
		Offensive midfielder	4-4-2 > 4-2-3-1 (35.29; not applicable)
		Forward	4-4-2 > 4-2-3-1 (5.26; not applicable)

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